

## CLAIMS

What is claimed is:

1. A method of designing a biodegradable/bioresorbable tissue  
5 augmentation/reconstruction device, said method comprising:  
creating a material density distribution within a device design  
shape for discrete points during a material degradation lifecycle;  
weighting said material density distribution using a weighting factor  
to determine a weighted density;  
10 using said weight density to determine a material reinforcement of  
said device such that said device will retain predetermined structural properties  
during said material degradation lifecycle.
2. The method according to Claim 1 wherein said material density  
15 distribution is creating using a technique chosen from the group consisting  
essentially of topology optimization, microstructure topology optimization,  
restricted topology optimization, image-based design, and computer-aided  
design techniques.
- 20 3. The method of Claim 2 wherein said topology optimization includes  
an algorithm employed to define said material density distribution at  
predetermined time points during said material degradation lifecycle.
4. The method of Claim 2 wherein said image-based design includes  
25 defining said material density distribution at predetermined time points during  
said material degradation lifecycle.
5. The method of Claim 2 wherein said general computer aided  
design techniques include defining said material density distribution at  
30 predetermined time points during said material degradation lifecycle.

6. The method according to Claim 1 wherein said weighting factor is chosen from the group consistently essentially of a linear weighting factor, a nonlinear weighting factor, a time past degradation factor, and a ratio of a degraded material property to initial material property.

5

7. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded modulus to an initial modulus.

10

8. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded strength to an initial strength.

15

9. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded thermal conductivity to an initial thermal conductivity.

20

10. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded electrical conductivity to an initial electrical conductivity.

25

11. The method according to Claim 1, further comprising:  
superposing said material density distribution at predetermined time points using both time, degraded base stiffness, and said weighting factor.

12. The method according to Claim 1, further comprising:  
superposing said material density distribution at predetermined time points using density at a global anatomic level.

30

13. The method according to Claim 12, further comprising:  
superposing said material density distribution at predetermined  
time points using density at a physical size smaller than said global anatomic  
level.

5

14. The method according to Claim 1 wherein said weighting said  
material density distribution using a weighting factor to determine a weighted  
density further includes employing material degradation kinetics to enhance said  
material density distribution.

10

15. The method according to Claim 14 wherein said employing  
material degradation kinetics further comprises employing one chosen from the  
group consisting essentially of polylactic acid, polyglycolic acid, polyanhydride,  
polycaprolactone, tri-calcium phosphate, and hydrogels.

15

16. A method of manufacturing a biodegradable/bioresorbable tissue  
augmentation/reconstruction device, said method comprising:

dividing the device into elements having a predicted material  
density between 0 and 1;

20

weighting each predicted material density by a predetermined  
degradation profile to define a weighted material density, said degradation profile  
being unique to a material used; and

25

calculating a material weight in each of said element by applying a  
time lasting factor and a degrading modulus factor such that high load bearing  
regions within said device are reinforced to compensate for subsequent stiffness  
degradation due to bulk erosion of said device.

17. The method according to Claim 16, further comprising:  
converting said weighted material density to surface representation  
for manufacture.

5 18. The method according to Claim 17 wherein said converting said  
weighted material density to surface representation for manufacture includes  
converting said weighted material density to a STL surface representation.

10 19. The method according to Claim 17 wherein said converting said  
weighted material density to surface representation for manufacture includes  
converting said weighted material density to a Computer Aided Design (CAD)  
surface.

15 20. The method according to Claim 17 wherein said converting said  
weighted material density to surface representation for manufacture includes  
converting said weighted material density to a wireframe representation.